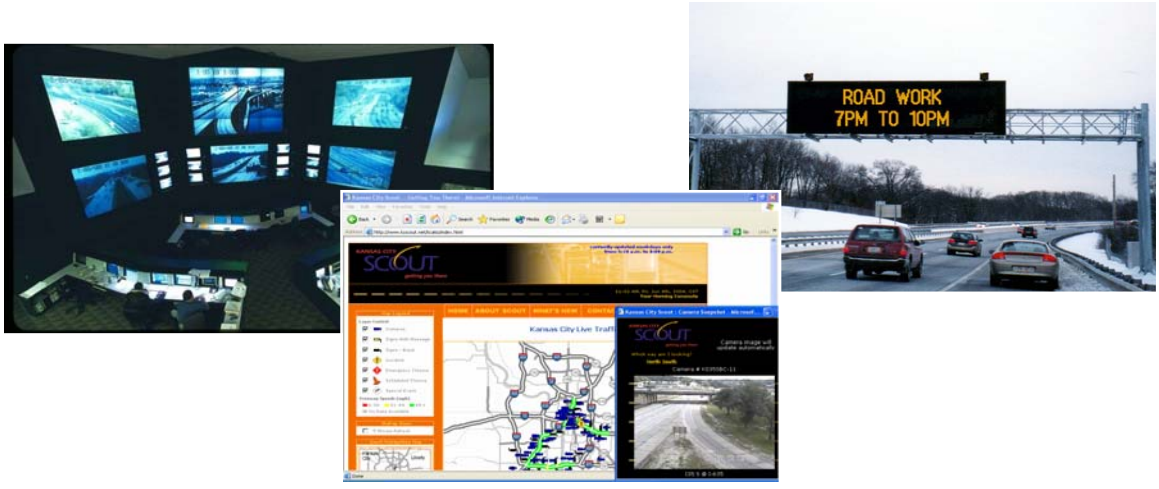
Part 7: Intelligent Transportation Systems

Overview

This section of the Long Range Transportation Plan (LRTP) describes the past planning efforts of the Intelligent Transportation Systems (ITS) stakeholders in the metropolitan planning area and where the ITS program is headed. ITS is the application of technology to the transportation system to make it safer and more efficient. ITS applications can benefit various parts of the overall transportation system, including traffic operations, commercial vehicle operations, tourism, emergency responders, public works agencies, the traveling public, and transit operations. Almost anyone who uses the transportation network can be affected by the use of ITS technologies and practices.

Some examples of ITS technologies include the following:

- Traffic Operations Centers (TOC) to monitor roadways for incident and congestion and relay that information to emergency responders
- Automated Vehicle Location (AVL) to track the location of transit vehicles to ensure they are on schedule and emergency responders for more efficient dispatching and responder safety.
- Use of 511 and dynamic message signs to provide accurate traveler information to the public so they can make informed decisions on the route they use.
- Coordination of traffic signals along an arterial to provide additional capacity and reduce emissions from idling vehicles.



Wichita has been investigating the use of ITS since 1997 to reduce congestion and coordinate emergency response within the Wichita metropolitan area. An ITS Committee has been formed with membership from the city, county, Wichita Area Metropolitan Planning Organization (WAMPO), Federal Highway Administration (FHWA), and the Kansas Department of Transportation (KDOT) to help coordinate and direct the area's growing ITS program. Wichita has received several Federal funding appropriations for investment in ITS technologies and projects and is poised to deploy ITS throughout the area within the next few years, including a new transportation operations center, coordination of traffic signals, deployment of cameras and message boards, and the use of AVL on emergency and transit vehicles.

Background

ITS planning efforts have been underway since 1997 when WAMPO and KDOT began the Wichita Early Deployment Study (EDS) with the assistance of a grant from the FHWA to begin ITS planning in the top 75 cities in the United States.

Relevant ITS documents include the Wichita Metropolitan Area ITS Strategic Deployment Plan (product of the Early Deployment Study), the Kansas Statewide ITS Plan, the Mobile Data and Automatic Vehicle Location Needs Assessment and Alternative Analysis Report, and the Wichita-Sedgwick County Regional ITS Architecture (RITSA).

According to the Wichita Metropolitan Area ITS EDS (KDOT, 1998), most of the congestion being generated is due to non-recurring congestion rather than recurring congestion. Recurring congestion is typical of roadways with insufficient capacity or poor geometrics where vehicles are forced to slow down, creating choke points in the traffic flow. This type of congestion occurs on a daily basis and is somewhat anticipated by drivers. Non-recurring congestion occurs due to unexpected events like crashes, disabled vehicles, special events, or construction. It can happen anytime of the day and, due to its unpredictability, tends to surprise drivers and cause secondary accidents along with sever congestion. The Early Deployment Study identified that non-recurring congestion was the primary cause of delay in the Wichita area. The use of ITS to assist with traffic incident and event management is seen as the primary tool to combat non-recurring congestion along with good incident management practices.

As part of the ITS Strategic Deployment Plan, it was recommended that cameras, message boards, highway advisory radio and vehicle detection be deployed, along with associated communications systems, throughout the metropolitan area incrementally. The increments were broken up into short, medium, and long term deployments. These basic strategies of deploying ITS equipment and monitoring the most heavily congested roadways or high accident locations are still valid. Figure 3.7-1 shows the original ITS deployment map.

ITS Deployment Phases for Wichita

Figure 3.7-1: ITS Deployment Phases in Wichita (Wichita ITS Strategic Deployment Plan, 1998)

This process of conducting an Early Deployment Study and subsequent deployment of ITS solutions and technologies has been successfully implemented in other metropolitan areas similar to Wichita such as Nashville, Charlotte, and locally in Kansas City.

In 2004, WAMPO commissioned the development of the Regional ITS Architecture and the final documents were published in May 2005. The development of the architecture was performed so that the metropolitan area would be in compliance with FHWA Rule 23 CFR Part 940, which calls for a region to have an approved ITS architecture. Even though this rule only applies

to federal funds, KDOT has requested the Regional ITS Architecture be in place for the expenditure of any state funds. The Regional ITS Architecture is currently under review by the FHWA for acceptance and is approved by the WAMPO.

The RITSA has undertaken the task of summarizing past documents, planning efforts, and stakeholder input in a common framework that addresses interoperability between agencies. As it is the most recent effort and therefore most accurately reflects the attitudes and opinions of ITS stakeholders in the planning area, this document will serve as the basis for the information and projects presented in the LRTP.

Current System

There are currently a few ITS technologies deployed in the Wichita area:

- Sedgwick County is beginning the construction of the new 911 emergency dispatch center that will include co-location with the traffic operations center to be developed by KDOT.
- The City of Wichita has over 550 signalized intersections. The city has controllers operating in a closed loop configuration that controls over 300 of the intersections. Wichita has an arterial traffic management center that controls the signal timing. The city also has some traffic signal pre-emption devices in place for emergency vehicles.
- Flood monitoring and warning systems are located along flood prone streams and relay information back to the public works department.
- KDOT has a recently developed 511 system in place statewide that provides road and construction information.
- KDOT has a fiber optic communication backbone that runs along I-135 through Wichita for future ITS communications.
- The KTA is has installed a system of highway advisory radio stations along I-35 and has cameras located at each toll plaza.
- The Kansas Highway Patrol currently operates a Motorist Assist Patrol in the Wichita area to assist stranded motorists and conduct incident management.

Regional Needs Assessment

The current and future ITS needs of the Wichita-Sedgwick County metropolitan area include:

- Coordinated traffic incident management activities to clear incidents more quickly and reduce the associated congestion and secondary accidents.
- Coordination of all traffic signals in the downtown area and throughout the city to provide more arterial capacity and better traffic management.
- A communications infrastructure, both wireline and wireless, that will allow for the transmission of ITS data between the traffic operations center, ITS field devices, City of Wichita offices, Sedgwick County offices, emergency

vehicles, transit vehicles, public works vehicles, and other stakeholders in the region.

- The creation of a traffic operations center co-located with emergency response agencies in order to provide more effective traffic incident response and management.
- An automated vehicle location system to support the tracking of emergency services vehicles, transit and para-transit vehicles, and public works vehicles to provide more efficient dispatching and tracking of public resources.

Project List

The ITS projects to be presented come from the RITSA document. In Section 2.3 of Volume 2 of the RITSA, it is stated that projects and project sequencing listed in the RITSA should be used as an input for the LRTP of WAMPO. Major ITS projects and initiatives that will affect the Wichita area will be listed and described in this section. For a complete list of projects, please see Volume 2, Section 3 of the Wichita-Sedgwick County Regional ITS Architecture document.

As background on how the ITS projects were selected, it is important to note that during the RITSA development process, WAMPO undertook a comprehensive review of past ITS planning documents to identify ITS projects and, most importantly, gathered stakeholder feedback on that project list to ensure that the project met stakeholder needs and that the timelines presented were appropriate and realistic. The projects presented in the RITSA are by reference incorporated into the LRTP and eventually will be funded through the TIP and be implemented as funding is available.

Project sequencing provided by the RITSA is divided up into distinct timeframes for implementation as was decided by the region's ITS stakeholders during the

development of the RITSA. Table 3.7-1 defines those timeframes. These timeframes may be adjusted in the future based on priority.

ITS Project Time Frames

Time Frame	Planning Period	Fiscal Year(s)
Existing	Currently Exists	2005
Near-Term	5-Year Plan	2005-2009
Medium-Term	10-Year plan	2010-2014
Long-Term	20-Year Plan	2015-2024 *
Not Planned	Beyond 20 Year Plan	Beyond 2024 *

Table 3.7-1: Project Timeframes (from the Wichita – Sedgwick County Regional ITS Architecture, Vol. 2, Sect. 1)

* Note that an error in Table 1 of RITSA Volume 2 was corrected here to show the end time frame for the 20-year planning period as 2024 versus 2019.

Major ITS initiatives/projects for the Wichita-Sedgwick County metropolitan area include the following:

City of Wichita Traffic Operations Center Implementation
Capital Cost: $2,000,000
Deployment Timeline: Near Term
Description: This project will seek to enhance the current city traffic operations center and expand its functionality beyond traffic signal control to include monitoring arterials with cameras, coordinating operations with other agencies and emergency services, disseminating traveler information to the public, and interfacing with the local media.
RITSA Project #: 1

City of Wichita Signal System Upgrade Design and Implementation
Capital Cost: $10,500,000
Deployment Timeline: Near Term to Long Term
Description: This project will provide for the design and deployment of an advanced traffic signal control system that will allow the city to monitor and control over 500 intersections from the city traffic operations center. The project will also seek to develop traffic signal control plans and ultimately create a demand responsive system.
RITSA Project #: 2B, 2C, 2D

KDOT Traffic Operations Center Design and Implementation

Capital Cost: $22,700,000

Deployment Timeline: Near Term to Long Term

Description: This project will provide for the design and deployment of the KDOT Traffic Operations Center co-located in the Sedgwick County 911 Emergency Dispatch Center. It will include ATMS software, roadside ITS equipment, communications, and design services. Once complete, the TOC will be capable of monitoring freeways and expressways in the Wichita area in order to coordinate emergency response to traffic incidents and provide traveler information to motorists, the media, and 511.

RITSA Project #: 4B, 4C, 4D, 4E

Wichita Area WiMax Communications Design and Implementation

Capital Cost: $3,200,000

Deployment Timeline: Near Term

Description: This project will design and deploy a WiMax communications design within the limits of the City of Wichita. This will provide a seamless wireless communications backbone throughout the city for the transmission of data between city vehicles and dispatchers. An AVL application is to be developed to make use of the WiMax network. Users of this network are anticipated to be public safety vehicles, transit vehicles, and public works vehicles.

RITSA Project #: 5A, 5B, 5C

Public Safety AVL Project

Capital Cost: $2,500,000

Deployment Timeline: Near Term

Description: This project will build upon the WiMax communications infrastructure deployment by deploying an AVL system in emergency service vehicles throughout the Wichita-Sedgwick County area. It is envisioned that dispatchers will be able to know in real-time the status and location of emergency resources such as police and fire and be able to dispatch the closest available responder and dynamically route them to avoid congestion caused by the incident or other route blockages such as train traffic. Coordination of arterial traffic signals along an emergency vehicle's response route is a future possibility.

RITSA Project #: 22, 23, 24, 25

City of Wichita Transit Vehicle Tracking and Management System

Capital Cost: $1,800,000

Deployment Timeline: Near Term

Description: This project uses the AVL communications infrastructure established in the WiMax project to allow transit vehicle tracking throughout the city. The location information is fed back the Wichita Transit Center where schedule adherence is calculated and updated route information and arrival times are disseminated to users.

RITSA Project #: 14, 15, 16, 17

Some of the projects noted above have multiple phases and timelines for deployment. For ease of describing, some of the project phasing has been combined. For a complete list and description of all 34 ITS projects presented in the RITSA, see Volume 2, Section 3 of the RITSA. It should be noted that not all of the projects listed in the RITSA will be implemented due to funding constraints. The availability of funding will determine if the projects are funded in the timeframe shown.

In addition to the capital costs shown for each project, ongoing operations and maintenance costs are associated with these projects as well. These costs must be considered when budgeting or approving projects. Shown below are the capital and operations/maintenance costs from the RITSA. The capital costs associated with of all 34 projects in the RITSA are shown by the projected fiscal year they are scheduled start. The expected operations and maintenance costs for these projects are also shown by fiscal year. It should be noted that the operations and management costs (O&M) continue on long after the project is implemented.

ITS Project Costs

Timeframe	Capital Costs	Operations & Maintenance Costs
Year 1	$2,203,333	--
Year 2	$6,308,333	$140,333
Year 3	$2,625,000	$712,999
Year 4	$6,883,334	$730,100
Year 5	$6,908,334	$1,361,166
Year 6	$2,551,667	$2,174,000
Year 7	$3,335,000	$2,518,500
Year 8	$3,475,000	$2,849,000
Year 9	$3,175,000	$3,573,500
Year 10	$2,375,000	$3,926,000
Year 11	$3,550,000	$3,468,500
Year 12	$1,975,000	$4,181,500
Year 13	$1,240,000	$4,703,000
Year 14	$1,240,000	$4,827,000
Year 15	$1,240,000	$4,951,000
Year 16	--	$5,531,000
Year 17	--	$5,531,000
Year 18	--	$5,531,000
Year 19	--	$5,531,000
Year 20	--	$5,531,000

Table 3.7-2: Costs Associated with ITS Project Deployment by Fiscal Year (RITSA, Vol. 2, Sect. 4)

Maintenance of the Project List and ITS Architecture

The incorporation of projects from the RITSA into the LRTP will by nature be associated with the RITSA. Projects will necessarily go through changes as they proceed from the RITSA to the LRTP to the TIP and eventually to implementation and operations. As part of the process of upgrading and maintaining the regional ITS architecture, these changes need to trigger a process for the updating of the RITSA. A RITSA maintenance process has been developed and will be summarized here, but is presented in greater detail in Volume 2, Section 7 of the RITSA.

WAMPO has been designated Architecture Manager or keeper of the regional ITS architecture as they represent the transportation interests of the region and have championed the ITS architecture process for many years. Since multiple stakeholders must be involved in architecture maintenance, the ITS Architecture Technical Committee (ITC) should continue to meet to make decisions about revisions to the architecture. The Architecture Manager (WAMPO) will accept Architecture Change Request Forms and present them to the ITC. An example of the Change Request Form is located in Appendix A of the RITSA. The Architecture Manager will track changes using the Change Control Log, which is shown in Appendix B of the RITSA. When the ITC decides to revise the Wichita-Sedgwick County ITS Architecture, the Architecture Manager will ensure that the changes to the architecture are made and that the architecture configuration management process is followed.

Summary

ITS is the application of technology to the transportation system to make it safer and more efficient. Wichita has been investigating the use of ITS since 1997 to alleviate congestion and coordinate emergency response within the Wichita metropolitan area. An ITS Architecture Technical Committee (ITC) has been formed with membership from the city, county, WAMPO, FHWA and KDOT to help coordinate and direct the area's growing ITS program.

A few ITS technologies are currently deployed in the Wichita area, including the construction of the new 911 emergency dispatch center, the traffic management center, flood monitoring, 511 information system (Figure 3.7-2), KTA's highway advisory radio, and the fiber optic communications backbone along I-135. Current and future needs include coordinated traffic incident management, coordination of all traffic signals, communications infrastructure for the transmission of ITS data, a traffic operations center co-located with emergency response agencies, and an automated vehicle location for tracking emergency, transit, and paratransit vehicles.

Statewide 511 Traveler Information System

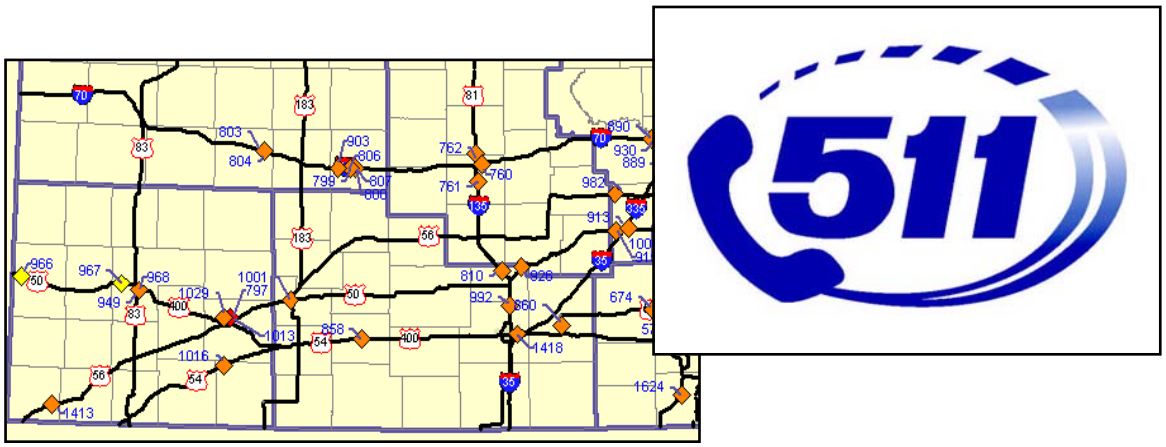


Figure 3.7-2: Statewide 511 Traveler Information System

The recently completed Regional ITS Architecture recommends 34 ITS projects to be implemented by 2014 that are incorporated by reference into the LRTP. The total estimated capital cost if all these projects are implemented is $49,085,000. In addition, operation and maintenance costs must be considered as these will grow from approximately $140,000 a year near the beginning of the deployment to over $5,500,000 per year after the projects have been implemented. This includes a fully functional operations center along with the other listed projects.